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BIOLOGICAL EVALUATION OF POTENTIAL HAZARD TREES AND PEST CONDITIONS OCCURRING WITHIN THE SANTA CLARA CANYON RECREATION AREA, SANTA CLARA PUEBLO INDIAN RESERVATION DECEMBER 1990

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DECEMBER 1990

By

Terrence J. Rogers

USDA Forest Service, Southwestern Region
State and Private Forestry
Forest Pest Management
517 Gold Avenue, SW
Albuquerque, New Mexico 87102

ABSTRACT

In 1989, Forest Pest Management, Region 3, initiated an Insect and Disease Incidence Survey Program of Recreation Sites. The purpose of this program is to evaluate the overall "health" of proposed and existing recreation sites on National Forests and other Federal lands in the Southwest. At the request of Chris Tootell, Northern Pueblos Agency, Terry Rogers, Forest Pest Management Specialist, and Richard Norris, Biological Technician, Forest Pest Management, New Mexico Zone, conducted a hazard tree survey and an evaluation of forest pest conditions at the Santa Clara Canyon Recreation Area, Santa Clara Pueblo Indian Reservation (IR). These surveys were conducted during June, 1990.1990.

OBJECTIVES

The objectives of these surveys were to: (1) Identify hazardous trees occurring within the Santa Clara Canyon Recreation Area, and (2) evaluate the incidence of insect and disease pest related damages.

SURVEY DESIGN

The procedures followed during this survey are described in the "Inventory of Insects, Diseases, and Hazard Tree Incidence Work Plan for Developed Recreation Sites on National Forest System Lands in the Southwest" (Rogers 1989). The survey design consisted of two parts: (1) A hazard tree survey, and (2) an insect and disease pest incidence survey. A hazard tree is defined as any tree with both a structural defect that could cause the tree to fail and a potential target (ex. table, campsite, parking pad, toilet, etc.). Only trees located in areas of intensive public use and showing signs of structural defect (dead tops and/or branches, bole rot, exposed roots, etc.) were evaluated. Tree species, diameter inside bark (DIB), location, defect, and hazard tree rating were recorded on the Hazard Tree Evaluation Forms (Appendix).

The hazard tree rating system used is patterned on the procedures described by Johnson (1981) and involves the factors that contribute to tree failure such as dead limbs and weak forks, degree of lean, and signs of insect and disease-caused damages. This system involves a two-part Failure/Risk rating, each part using a descriptive rating scale of High (H), Medium (M), and Low (L) to estimate probability of "Failure" and "Risk." The first part of this rating system is an estimate of the probability that the tree, or major portions thereof, will fail within the next five years; the second part is an estimate of the probability that the failed tree, or portions thereof, will cause personal injury or damage to property if failure does occur.

The insect and disease pest incidence survey was a 100 percent tree survey conducted concurrently with the hazard tree survey. The following data were collected for each of the trees found exhibiting signs of insect, disease, and abiotic damages: Species, diameter at breast height (DBH), tree history, damage code, and dwarf mistletoe rating (DMR) (Hawksworth Six Class Rating System, 1977).

RESULTS

Seventeen developed sites were evaluated along the eight and one-half mile campground corridor of Santa Clara Canyon. Sites one to seven were composed predominantly of ponderosa pine and sites 8 to 17 of mixed conifer, primarily white fir and spruce intermixed with aspen and a few overstory Douglas-firs. Ninety-five trees were rated for hazard during this survey. The number of trees in each rating class or category are listed in Table 1. All of the rated trees were either dead, had dead tops, or exhibited severe signs of decay. More than half of the trees rated for hazard (59 trees) were given a "High Failure/High Risk" rating (H/H) because of their high probability of failing within the next five years and potential for causing damage to property and/or personal injury. Nineteen of the trees rated for hazard were the result of recent mortality caused by the western pine beetle, Dendroctonus brevicomis. Four of these bark beetle-killed trees were rated as potentially hazardous. Specific information on tree history, defect, and exact location are provided on the enclosed Tree Hazard Evaluation Forms (Appendix).

TABLE 1.

Summary of hazard trees by rating class, Santa Clara Canyon, Santa Clara IR.

Campground	Number of Trees with Rating of: H/H[a]	H/M	H/L	M/H	M/L	L/H
Santa Clara Canyon CG	59	16	5	5	8	2

CG = Campground

[a] Failure/Risk Rating: H = High; M = Medium; L = Low

The hazard tree ratings provided are not recommendations for action. They are a professional estimate of the probability of tree failure and should be used by the forest manager during the decision-making process when developing management plans for the recreation area. Highest priority should be given to category 1 trees (H/H), since they are the most prone to failure within the next five year period and present the greatest risk to property and public safety. Trees in categories two to six (H/M, H/L, M/H, M/L, and L/H) should be monitored and as their hazard rating increase to the "High Failure/High Risk category (H/H), removed as needed to maintain an acceptable level of risk.

Most of the pest-related damages in this recreation area were due to disease infections caused by the aspen cankers Encolia pruinosa, (sooty-bark canker), Cytospora chrysosperma, (cytospora canker), and Ceratocystis fimbriata, (black canker). Of the 42 canker-diseased aspens examined during this survey, 39 were dead. Thirty-six of these trees were given a "High Risk" rating because of their potential for failure and their proximity to permanent structures and areas of public access. Most of these "High Risk" canker-killed trees have been dead for two to three years and are also heavily infected with the aspen trunk rot fungus, Phellinus tremulae, further increasing the probability of their failing, particularly from wind breakage.

The only significant forest insect pest related damages found during this survey were those caused by the western pine beetle (WPB), Dendroctonus brevicomis. A total of nineteen ponderosa pines, ranging from 5 inches to 21 inches in DBH, were attacked and colonized by these bark beetles. Mortality occurred both singly and in small groups of two to six trees. As previously indicated, four of these WPB-killed trees were rated as "High Risk" because of their high probability of failing and potential for causing property damage and personal injury. These WPB-killed trees were salvage-logged shortly after this survey was completed.

Other minor pest related damages recorded during this survey included those caused by the western spruce budworm (WSB), Choristoneura occidentalis, and Douglas-fir dwarf mistletoe, Arcuethobium douglasii. Western spruce budworm defoliation was observed at several of the campsites along the western half of the canyon. Defoliation damages (needle loss) on white fir and Douglas-fir, however, was barely detectable indicating WSB population densities in this recreation area are at very low (endemic) levels. Aerial insect and disease survey flight records dating back to the early 1950s show this destructive insect defoliator has rarely caused significant tree damages (top-killing and tree mortality) in this canyon. Douglas-fir dwarf mistletoe, the only other important disease pathogen found in this recreation area, was observed at several locations along the western half of the canyon. This debilitating parasite, however, is not expected to pose a serious threat to management objectives since Douglas-fir is a relatively minor component of the stands making up this recreation area.

BIOLOGY OF PESTS

Sooty-bark Canker, Encoelia pruinosa

Sooty-bark canker is named for the black residue formed under the bark that adheres tightly to the trunk for many years even after the death of the tree. This canker is very aggressive and can cause tree mortality within four to five years after initial infection. Spores of the fungus are formed on light-grey, cup-shaped fruiting bodies on the old, dead inner bark. This disease occurs in association with cambial bark wounds; the dead, outer bark sloughs off two to three years after initial infection, exposing the blackened inner bark in an elliptical pattern.

Cytospora Canker, Cytospora chrysosperma

This aspen disease is widespread. Infected branches or stems contain tiny, dark, pimple-like spore bodies which produce orange to dark red spore masses. Wood beneath the canker is often stained light brown. In general, little mortality is directly caused by this disease. This canker disease may also be found in association with wounds or natural openings such as leaf scares and openings in the bark. Although cytospora canker is not considered a vigorous parasite on healthy trees, it can hasten the death of trees injured or weakened by other agents such as weather, insects, other diseases, and man.

Black Canker, Ceratocystis fimbriata

Black canker produces a target-shaped canker frequently seen on aspen trees. This canker is generally associated with wounds on the trunk. This canker seldom kills trees since it only spreads a short distance on the tree each year. In some cases, two or more cankers may eventually kill the tree by coalescing and girdling it. Old cankers can weaken the trunk and cause the tree to fail.

Aspen Trunk Rot, Phellinus tremulae

Aspen trunk rot is the most common cause of defect in aspen. Fruiting bodies or conks of this fungus are frequently found on stems of living and dead trees and often occur near branch stubs or old wounds. Conks are hoofed-shaped; the upper surface is grey to black and divided into irregular squares by numerous cracks. The interior of the conk has white flecks and a layered appearance; the color of the lower surface varies from tan to white to dark brown and has many tiny spores. Trees with more than three conks above 16 feet are generally severely decayed and susceptible to windthrow and stem breakage at any time. This decay is most common in overmature stands of trees; however, it can also infect young trees.

Western Pine Beetle (WPB), Dendroctonus brevicomis

Western pine beetles mass-attack stands of ponderosa pine, carrying and transmitting fungi which aid in killing the host. These bark beetles produce between two and four generations per year depending on latitude and elevation. Flight and attacks start in late spring or early summer and continue until the onset of cold weather (DeMars, 1982). Western pine beetle attacks are initiated by adult females, usually at mid-bole. Evidence of attack is marked by white to reddish pitch tubes on the bark. The attack process is mediated by chemical messengers or pheromones released by the beetles in combination with host terpenes. The beetles excavate winding, sinuous egg galleries under the bark. Eggs are laid in niches chewed into the sides of the gallery. Once the eggs hatch, the larvae feed in short galleries perpendicular to the parent gallery. Later, larval stages feed in the middle bark. Pupation also occurs there. Brood adults first feed in the middle and outer bark before emerging. This cycle varies in length from two to ten months depending on temperature.

This insect usually breeds in scattered, slow growing, overmature trees or in trees diseased or damaged by other agents. Group-killing is also common in dense, overstocked stands of young sawtimber. Trees under six inches in diameter are seldom attacked. Environmental stresses which permanently weaken individual trees or small groups of trees (lightening strikes, root disease, mistletoes, mechanical damage) or temporarily weakened whole stands (drought, defoliators, fires, etc.) predispose trees to attack and create conditions for outbreaks to occur. A good example was documented in southern California where effects of ozone damage were examined. Beetle productivity was greater in ozone-damaged trees since fewer attacks were required to kill the tree. The ratio of brood emergence to attacking beetles was greater for the ozone affected trees.

There are a number of natural enemies of this insect; woodpeckers, and several parasitic and predatory insects. However, the main factor thought to influence occurrence of outbreaks is the abundance of suitable hosts. Suppression of WPB populations has often been found to be expensive and unsatisfactory since timely

spotting and treatment is difficult. However, sanitation-salvage logging can be applied to minimize losses. Unacceptable losses can be prevented in most circumstances (barring severe drought) by maintaining thrifty, vigorous trees. Thinning dense 70-80 year old sawtimber stands, thereby reducing stocking to 55-70 percent of the basal area necessary for full site utilization, relieves competitive stress among remaining trees making them less prone to successful attack.

Individual, high value trees that are predisposed to attack by temporary stress may be given a protective residual bark spray to prevent successful attack. Such treatment can be effective if the protection for one or two years would allow the tree to recover. It should not be considered for trees suffering from severe root disease or damage.

MANAGEMENT ALTERNATIVES

1. Do nothing. Trees rated as potentially hazardous will continue to decline and the probability of failure will increase. Trees in recreation areas will continue to be damaged by campers and by natural causes, so the number of potential hazards will also increase. The probability of tree failure with property damage and personal injury will also increase.

2. Remove or lessen the probability of failure of hazard trees. The land manager is responsible for deciding the level of risk acceptable in an area. In many cases, pruning dead branches or dead tops would substantially reduce the probability of failure. When pruning hazardous branches on hardwoods drop-crotching (Figure 1, Appendix) is preferred over topping (Figure 2). Remaining leaders on drop-crotched trees will produce foliage to inhibit latent shoots, encourage callus growth over wounds, and add to the longevity and attractiveness of the tree. Unlike drop-crotching, topping results in rapid sucker growth. Such shoots are weak and destroy the natural shape of the tree. Dead tops on conifers should also be removed as soon as practical (Mills and Russell, 1981). For trees showing signs of internal decay, the thickness of sound wood in the outer shell determines relative safety. Trees that lean naturally usually are reinforced by compensatory growth. However, structural damage to leaning trees, such as severed roots, large basal cavities, and internal decay increase the probability of failure and threaten visitor safety (Johnson, 1981).

3. Remove the targets. Under this alternative, campgrounds or selected areas within campgrounds that are identified as targets are closed to public use. Removal of or moving potential targets will remove the problem of hazard trees.

4. Develop a vegetation management plan which reduces incidence of insect and disease and development of hazard trees. This may include activities such as thinning a dense stand of trees which reduces stress and probability of bark beetle attack; sanitizing to decrease the incidence of DM infection; pruning DM-infected trees to prolong life; and planting nonhost species under an infected Douglas-fir overstory.

5. A combination of alternatives 2 and 3 and 4. These alternatives are not mutually exclusive and can be used in combination to solve specific problems in many areas.

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APPENDIX

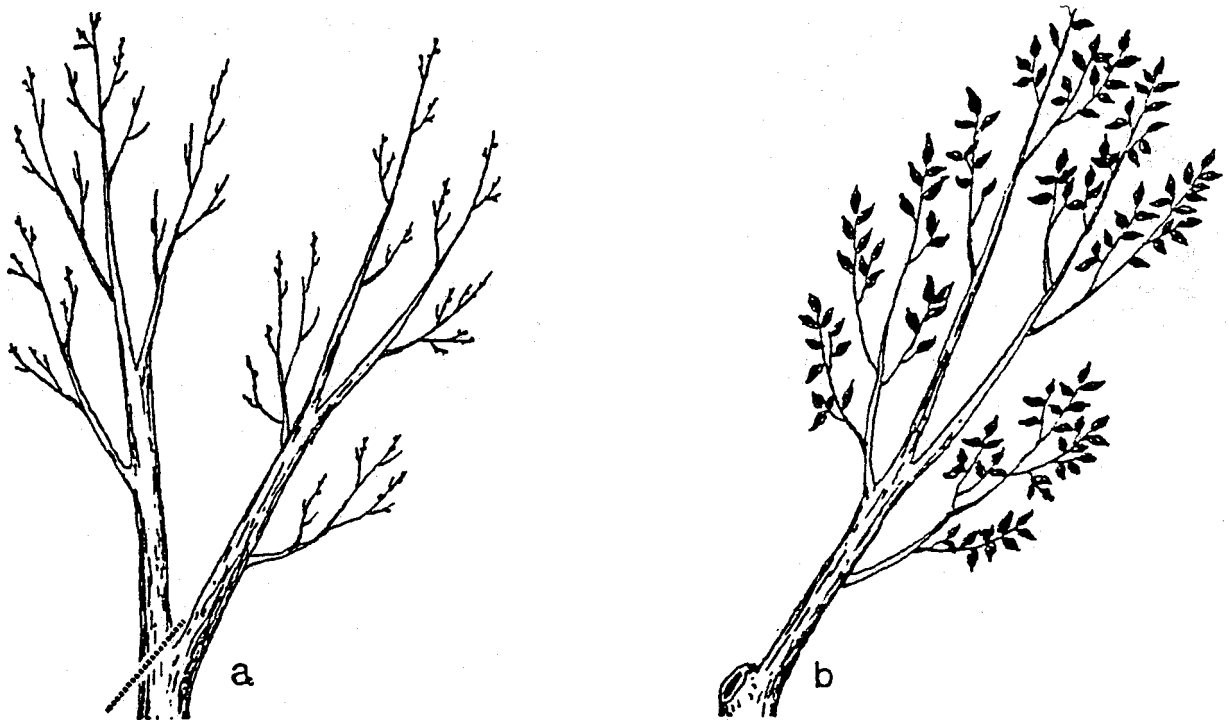

Figure 1 a. Drop-crotching to remove a limb. Remaining leader will produce foliage (b) to inhibit latent shoots and encourage callus growth over wound.

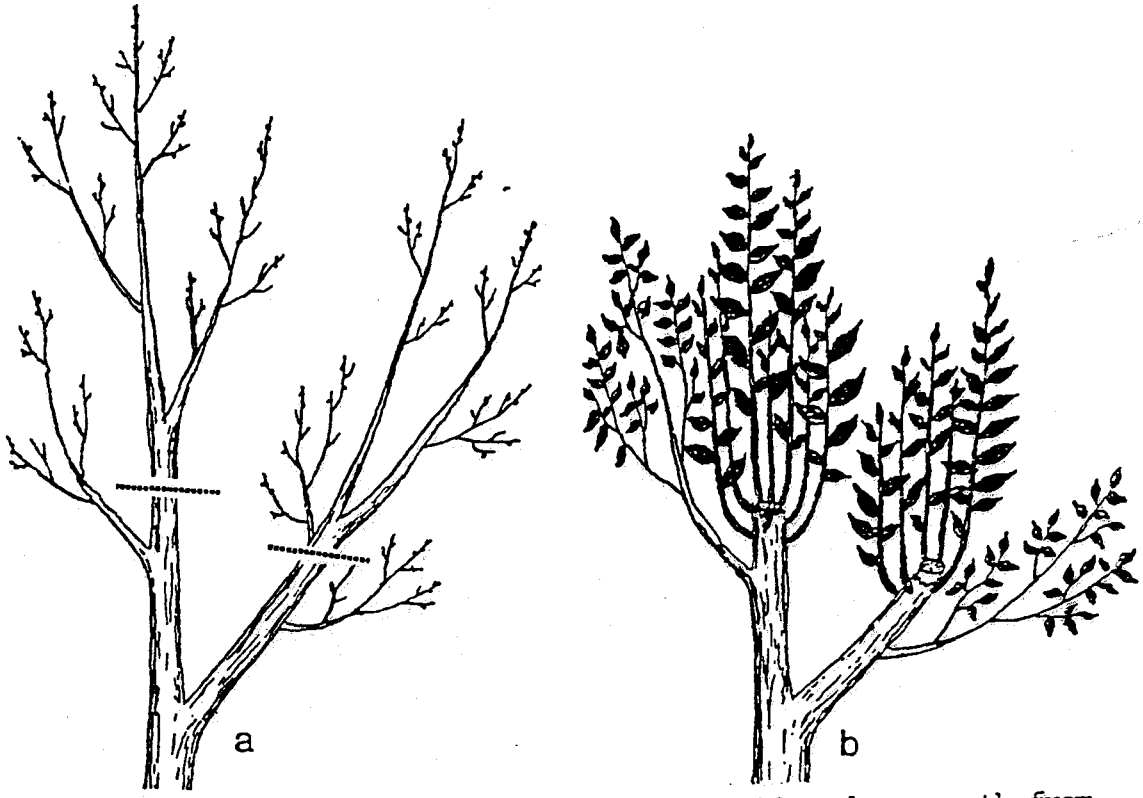

Figure 2 a. Topped trees will result in rapid sucker growth from latent buds (b). Such shoots are weak and destroy the natural tree shape.

TREE HAZARD EVALUATION

Administrative unit Santa Clara IR Rec site

Examined by TR/RN

Site name Survey

Date 6/5/90

Campground Unit No.	Pic	Tree Location (azimuth and distance from fixed object)	Species	D.b.h.	*See Abbreviations Type of defect: Leaning (angle of lean)	Up-rooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Permanent structure, high-use trails	Low-use trails, signs	Failure rating: High	Failure rating: Medium	Failure rating: Low	Risk rating: High	Risk rating: Medium	Risk rating: Low	Additional comments	Action
		ABBREVIATIONS: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*DEFECT ABBREVIATIONS: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak Fork, C=Conk(s), DT=Dead top, ER=Exposed roots	
		700' 135° ENTRY Gate	CW	38"				X					X				X	LD - DEAD LIMBS	
		50' 200° ENTRY GATE	CW	14"	X				X			X				X		DEAD TREE	
SITE 2		50' 350° ROAD	PP	12"								X					X	DEAD TREE	
SITE 3		50° 300° PARKING RAIL	PP	27"				X					X				X	LD - DEAD LIMBS	
11		NORTH FISHING BANK	PP	10"		X							X				X	ER	
11		N 11 340°	PP	18"		X							X				X	ER	
11		340°	PP	10		X							X				X	ER	
11		340°	PP	14		X							X				X	ER	
11		70' 210° FR*	PP	11					X				X				X	BARK BEETLE INFESTED TREE	

* THIS FR 90° FROM Parking Rail

TREE HAZARD EVALUATION

Administrative unit SANTA CLARA FR REC

Examined by TR/RM

Site name SITE SURVEY

Date 6/5 90

Campground Unit No.	Pic nic	Tree Location (azimuth and distance from fixed object)	Species	Dbh.	*See Abbreviations Type of defect: Leaning (angle of lean)	Up-rooting, root rot, butt rot, basal cavity	Bole wounds, holes cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Permanent structure, high-use trails	Low-use trails, signs	Failure rating: High	Failure rating: Medium	Failure rating: Low	Risk rating: High	Risk rating: Medium	Risk rating: Low	Additional comments	Action
		ABBREVIATIONS: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*DEFECT ABBREVIATIONS: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak Fork, C=Conk(s), DT=Dead top, ER=Exposed roots	
SITE 3		70' 210° FR	PP	8"					X				X				X	BARK BEETLE INFESTED TREE	
11		61' 330° WEST END PARKING LOT	PP	27"					X			X			X			DEAD TREE	
11		100' 270° WEST END PARKING LOT	PP	32"					X			X			X			DEAD TREE	
SITE 4		40' 212° STREAM BANK 3 TABLES	PP	40"		X			X			X				X		ER DEAD TREE	
11		60° 300' FR NEAR STREAM	PP	25"		X			X			X				X		DEAD TREE	
RANGER STATION		20' NORTH RANGER STA	PP	18"					X					X	X			ER	
11		20' NORTH RANGER STA	PP	22"					X					X	X			ER	
SITE 5		25' 330° UTILITY SHED	PP	12"					X			X			X			DEAD TREE	
11		SW CORNER POYI POND	PP	34"				X		X			X		X			DT, LD	

TREE HAZARD EVALUA

Administrative unit SANTA CLARA JR REC

Examined by TR/RM

Site name SITE SURVEY

Date 6/6/90

Camp or Unit No.	Pic	Tree Location (azimuth and distance from fixed object)	Species	DBH	*See Abbreviations Type of defect: Leaning (angle of lean)	Up-rooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Permanent structure, high-use trails	Low-use trails, signs	Failure rating: High	Failure rating: Med	Failure rating: Low	Risk rating: High	Risk rating: Med	Risk rating: Low	Additional comments	Action
		ABBREVIATIONS: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TT=Tent pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*DEFECT ABBREVIATIONS: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak Fork, C=Conk(s), DT=Dead top, ER=Exposed roots	
SITE 6		80' 318° TO	PP	12"	X					X		X			X			DEAD TREE	
SITE 7		180' 190° SHELTER	CW	18"	X		X	X			X	X				X		DEAD TREE SOUTH of CULVERT	
HOME SITE		200' 250° GARAGE	WF	22"					X		X		X			X		DEAD TREE	
11		130' 334° HOUSE	WF	15"					X			X			X			DEAD TREE	
BLANK.																			
1.8 mi		Along Road	WF	30"									X		X			DEAD TREE	
11		11	WF	20"					X			X			X			DEAD TREE	
11		11	WF	22"					X	X		X			X			DEAD TREE	
2.2 mi		LEFT SIDE OF ROAD up HILL	WF	20"	X				X	X		Y			X			DEAD TREE	

PLACE ROM etc

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TREE HAZARD EVALUATI

Administrative unit SANTA CLARA IR REC

Examined by TR/RN

Site name SITE SURVEY

Date 6/8/90

Campground Unit No.	Pic	Tree Location (azimuth and distance from fixed object)	Species	DBH	Leaning (angle of lean)	Up-rooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Permanent structure, parked vehicle, people	Permanent structure, high-use trails	Low-use trails, signs	Failure rating H	Failure rating M	Failure rating L	Risk rating H	Risk rating M	Risk rating L	Additional comments	Action
		ABBREVIATIONS: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump			*See Abbreviations Type of defect				Potential targets			Failure rating			Risk rating			*DEFECT ABBREVIATIONS: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak Fork, C=Conk(s), D/T=Dead top, ER=Exposed roots	
VILLAGE IRON GATE																			
12 2.2M		22FT SIDE OF ROAD UP HILL	WF	11"	X					X		X			X			DEAD TREE	
2.4mi SITE B		110° 146° TO	WF	17"							X	X			X			DEAD TREE	
"		110° 146° TO	WF	12"					X		X	X			X			DEAD TREE	
"		66' 122° FR	WF	30"						X			X		X			DYING TREE ACROSS STREAM	
1.6mi "		12M WEST SITE B	WF	30"					X			X					X	DEAD TREE	
"		"	WF	30"							X	X					X	DEAD TREE	
"		ALONG ROAD	WF	30"	X					X		X					X	DEAD TREE	
3.1 mi		RIGHT SIDE OF ROAD	WF	27"	X				X			X			X			DEAD TREE	
3.8 mi		RIGHT SIDE OF ROAD	A	20						X		X			X			DEAD TREE	

TREE HAZARD EVALUATI

Administrative unit SANTA CLARA FR

Examined by TR / RM

Site name REC SITE SURVEY.

Date 4/8/80

Campground Unit No.	Pic	Tree Location (azimuth and distance from fixed object)	Species	Dbh.	*See Abbreviations Type of defect: Leaning (angle of lean)	Up-rooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Permanent structure, high-use trails	Low-use trails, signs	Failure rating: High	Moderate	Low	Risk rating: High	Moderate	Low	Additional comments	Action
		ABBREVIATIONS: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TT=Tent pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*DEFECT ABBREVIATIONS: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak Fork, C=Conk(s), DT=Dead top, ER=Exposed roots	
Village Pkg SITE																			
3.8 mi		RIGHT SIDE OF ROAD	A	20"						X		Y			X			DEAD TREE	
13 11		ALONG ROAD SIDE	A	10"						X		X			X			DEAD TREE	
"		"	A	10"						X		Y					X	DEAD TREE	
	SITE 9	110° 90° TO	A	16"			X		X			Y			X			DEAD TREE	
3.9 mi	"	180° 320° TO	PP	22"					X		X	X			X			DEAD TREE	
	"	~~270°~~ 334° TO	S	25"					X			X			X			DEAD TREE	
	"	~~270°~~ 334° TO	A	16"			X		X			X			X			DEAD TREE	
	SITE 10	16' 180° FR	A	15"				X	X				X			X		DEAD TOP	
4.2 mi	"	SOUTH SIDE OF ROAD	SP	18"						X		X				X		DEAD TREE	

TREE HAZARD EVALUATION

Administrative unit SANTA CLARA FR

Examined by TR/RH

Site name REC SITE SURVEY.

Date 6/8 90

Camp or Unit No.	Pic	Tree Location (azimuth and distance from fixed object)	Spec	DBH	*See Abbreviations Type of defect: Leaning (angle of lean)	Up-rooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Permanent structure, high-use trails	Low-use trails, signs	Failure rating: High	Failure rating: Med	Failure rating: Low	Risk rating: High	Risk rating: Med	Risk rating: Low	Additional comments	Action
		ABBREVIATIONS: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*DEFECT ABBREVIATIONS: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak Fork, C=Conk(s), D/T=Dead top, ER=Exposed roots	
Mileage FROM GATE																			
SITE 4.7mi	11	33' 60° TO	A	14"		X	X	X				X			X			DEAD TREE	
14	11	30' 73° TO	A	17"		X	X	X	X			X			X			DEAD TREE	
	11	30' 220° TO	A	14"		X	X	X	X			X			X			DEAD TREE	
North OF SITE	11	30' 280° TO	A	16"		X	X	X	X			X			X			DEAD TREE	
	11	20' 146° FR	A	14"		X	X	X	X			X			X			DEAD TREE	
	11	30' 30° FR	A	16"		X	X	X	X			X			X			DEAD TREE	
	11	40' 340° FR	A	14"		X	X	X	X			X			X			DEAD TREE	
	11	59' 46° FR	A	12"		X	X	X	X			X			X			DEAD TREE	

TREE HAZARD EVALUAT

Administrative unit SANTA CLARA FR

Examined by RN / TR

Site name REC SITE SURVEY

Date 6/12/90

Campground Unit No.	Pic	Tree Location (azimuth and distance from fixed object)	Spec	Dbh	*See Abbreviations Type of defect: Leaning (angle of lean)	Up-rooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, broms, dead top	Potential targets: Permanent structure, parked vehicle, people	Permanent structure, high-use trails	Low-use trails, signs	Failure rating: High	Failure rating: Medium	Failure rating: Low	Risk rating: High	Risk rating: Medium	Risk rating: Low	Additional comments	Action
		ABBREVIATIONS: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*DEFECT ABBREVIATIONS: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak Fork, C=Conk(s), DT=Dead top, ER=Exposed roots	
15 Mile FRM Gate																			
North of SITE 11		1640' 76° FR	A	16"					X			X			X			DEAD TREE	
5.2mi JNC NEW & OLD ALIGNMENT SITE 11		50' 150° TO	A	16"					X			X			X			DEAD TREE	
5.4mi SITE 12		66' 204° MIDDLE TOILET	S	17"				X		X			X		X			DEAD TOP	
5.5mi "		10' 230° WATER PUMP	A	16"		X	X		X			X			X			DEAD TREE	
"		5' 334° TB	S	19"				X	X				X		X			DEAD TOP	
"		40' 338° TB	S	16"			X		X			X			X			DEAD TREE	
5.6mi "		10' WEST of ROAD	A	18"	RIGHT SIDE ROAD			X		X		X			X			DYING ASPEN	
"		132' 80° PUMP (WATER)	A	20				X	X	X		X			X			DYING ASPEN	
"		200' 132° SHELTER	PP	18							X	X			X			DEAD TREE	

TREE HAZARD EVALUATION

Administrative unit SANTA CLARA IR

Examined by TR/RM

Site name REC SITE SURVEY

Date 6/12/90

Campground Unit No.	Pinc or ning	Tree Location (azimuth and distance from fixed object)	Species	Dbh.	*See Abbreviations Type of defect: Leaning (angle of lean)	Up-rooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Permanent structure, high-use trails	Low-use trails, signs	Failure rating: High	Failure rating: Medium	Failure rating: Low	Risk rating: High	Risk rating: Medium	Risk rating: Low	Additional comments	Action
		ABBREVIATIONS: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*DEFECT ABBREVIATIONS: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak Fork, C=Conk(s), DT=Dead top, ER=Exposed roots	
Mileage FROM GATE																			
5.7mi	11	WEST OF SITE 12 Roadside	A	11 22"	RT SIDE OF ROAD					X		X			X			3-DEAD ASPENS ACROSS STREAM	
	11	11	A	18"								X			X			DEAD ASPEN	
	11	11	A	15"						X	X	X			X			DEAD ASPEN	
	11	ACROSS ROAD AT PRIMITIVE SITE	A	14"	LEFT SIDE OF ROAD				X			X			X			DEAD ASPEN	
5.8mi		FROM ABOVE PRIMITIVE SITE	A	12"	LEFT SIDE of ROAD				X	X		X			X			DEAD ASPEN	
5.9mi	SITE 13	66' 52° WATER PUMP	A	18"					X	X		X			X			DEAD TREE	
6.1mi		Road SIDE	A	14	LEFT SIDE OF ROAD				X	X		X			X			DEAD TREE	
6.2 mi		LEFT SIDE OF ROAD	A	16			X		X	X		X			X			DEAD TREE	
	11	11	A	14			X		X	X		X			X			DEAD TREE	

TREE HAZARD EVALUATION

Administrative unit SANTA CARA FR

Examined by TR/RH

Site name REC SITE SURVEY

Date 6/12/90

Campground Unit No.	Pic No.	Tree Location (azimuth and distance from fixed object)	Species	Dbh	*See Abbreviations Type of defect: Leaning (angle of lean)	Up-rooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Permanent structure, high-use trails	Low-use trails, signs	Failure rating: High	Failure rating: Medium	Failure rating: Low	Risk rating: High	Risk rating: Medium	Risk rating: Low	Additional comments	Action
Mileage From Gate		ABBREVIATIONS: TC=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*DEFECT ABBREVIATIONS: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak Fork, C=Conk(s), DT=Dead top, ER=Exposed roots	
6.2 mi		LEFT SIDE of ROAD	A	16"			X		X	X		X			X			DEAD TREE	
	17	"	A	14"			X		X	X		X			X			DEAD TREE	
		"	A	12"			X		X	X		X			X			DEAD TREE	
		"	A	12"			X		X	X		X				X		DEAD TREE	
		"	A	14"				X				X				X		DEAD TREE	
6.3 mi		LEFT SIDE ROAD	S	16"			X		X	X		X			X			DEAD TREE	
	SITE 14	66' 220° FLAGGED SPRUCE	A	20"	XXX		X		X	X		X			X			DEAD TREE	
6.6 mi	Nana Ka Sump	132' 640° FR	S	30"	LEFT OF ROAD						X	X				X		DEAD TREE	
		132' 214° WEST Parking Railing	S	17				X		X		X				X		DEAD FORKED TOP	

XXX THIS TREE ON ROADSIDE ON LOOP S OF POND

TREE HAZARD EVALUATI

Administrative unit SANTA CLARA FR

Examined by TR/RH

Site name REC SITE SURVEY

Date 6/13/90

Campground Unit No.	Picnic	Tree Location (azimuth and distance from fixed object)	Species	D.b.h.	*See Abbreviations Type of defect: Leaning (angle of lean)	Up-rooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Permanent structure, high-use trails	Low-use trails, signs	Failure rating: High	Failure rating: Medium	Failure rating: Low	Risk rating: High	Risk rating: Medium	Risk rating: Low	Additional comments	Action
Village From Gate																			
6.8mi		132' 76° WATER PUMP	A	17	LEFT SIDE OF ROAD			X		X		X			X			DEAD ASPEN HUNG UP	
7.1mi		.5mi WEST NANA KA POND	S	30"	LEFT SIDE OF ROAD ACROSS STREAM					X		X				X		DEAD TREE	
7.2mi		JUST WEST OF SITE 15	S	15"	LEFT SIDE OF ROAD					X		X				X		DEAD TREE	
7.3mi		70' 200° TB	S	20"	LEFT SIDE OF ROAD ACROSS STREAM						X	X				X		DEAD TREE	
7.7mi	SITE 16	66' 244° SHELTER	S	24"	LEFT SIDE OF ROAD							X				X		DEAD TREE	
"		190' 42° SHELTER	S	20"							X	X				X		DEAD TREE	
"		"	S	20"							X	X				X		DEAD TREE	
"		25' 230° TO	A	24"	Right SIDE OF ROAD				X			X			X			DEAD TREE	
"		LEFT SIDE OF ROAD	A	20"					X			X				X		DEAD TREE	

*DEFECT ABBREVIATIONS:
RR=Root rot
BR=Bole or butt rot
BW=Bole wound
BC=Basal cavity
LD=Limb defect
WF=Weak Fork
C=Conk(s)
DT=Dead top
ER=Exposed roots

TC=Toilet
TB=Table
FR=Fire ring
PF=Parking pad
TP=Tent pad
WH=Water hydrant
BG=Bridge
TC=Trash can
TD=Trailer dump

TREE HAZARD EVALUATI

Administrative unit SANTA CLARA FR

Examined by TR/RM

Site name REC SITE SURVEY

Date 6/13/90

Camp or ground Unit No.	Pilgrimage Code	Tree Location (azimuth and distance from fixed object) — ABBREVIATIONS: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump	Species	Dbh	*See Abbreviations Type of defect: Leaning (angle of lean)	Up-rooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Permanent structure, high-use trails	Low-use trails, signs	Failure rating: High	Moderate	Low	Risk rating: High	Moderate	Low	Additional comments	Action
																		*DEFECT ABBREVIATIONS: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak Fork, C=Conk(s), DT=Dead top, ER=Exposed roots	
19																			
7.9mi		RIGHT SIDE OF ROAD	A	20"					X			X			X			DEAD TREE	
8.2mi		.1mi WEST OF TSICHOM POND	S	16"					X		X	X			X			DEAD TREE	
		1ST shelter North OF POND	S	19"					X	X		X			X			DEAD TREE	
8.5mi		LAST LOOP 50' 218° 1ST TB	S	30"					X			X			X			DEAD TREE	
		50' 10° TO	A	16"					X	X		X			X			DEAD TREE	
		50' 10° TO	A	16"					X	X		X			X			DEAD TREE	
		66' 312° TO	S	18"					X	X		X			X			DEAD TREE WITH BROKEN TOP.	